PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Apparatus for Grouping Articles into Package Units

We, OLIN MATHIESON CHEMICAL CORPORATION, a corporation organized and existing under the laws of the State of Virginia, United States of America, of 460 Park Avenue, New York 22, New York, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to apparatus for forming package units by grouping a plurality of containers, and mechanically folding and interlocking a wrapper blank about the group.

The invention more specifically relates to novel apparatus for separating continuously moving rows of containers into groups about which a wrapper blank can be folded and interlocked to form a package unit.

In apparatus for forming package units; containers are delivered to a packaging machine in one or more rows by a continuously moving conveyor. The packaging machine comprises three main sections which can be identified as:

1) A grouping section in which one or more rows of containers are separated into spaced groups of two or more containers. This apparatus is described in detail in this application.
2) A blank applying section in which a wrapper blank is aligned with and placed on each group.
3) A folding section wherein the wrapper blank is mechanically folded about the group and interlocked to form a package unit.

Various device are known in the prior art for separating one or more moving rows of containers into groups. These devices take the form of separating plungers mounted on continuously moving chains; or stop members interposed at spaced intervals between moving rows of containers to hold back the rows while groups having a predetermined number of containers are formed. There are certain inherent disadvantages in the known prior art struture due to their relatively complicated design which makes them difficult to maintain and to adjust. The most serious disadvantage, however, is that the lines of containers being delivered to the machine encounter a momentary delay while they are grouped. The delay necessary for grouping reduces the overall speed and efficiency of the packaging machine, since the rate at which the containers can be grouped determines the overall speed at which the machine can run.

This specification discloses novel mechanism for grouping containers being fed to packaging machine in one or more continuously moving lines which is simple in design, efficient in operation and requires no momentary delay as the containers are grouped. The mechanism is furthermore readily adjustable to accommodate containers being fed to the machine in single or double rows and can be readily adjusted to provide groups of two or more containers for each package unit.

In a particular manner of carrying out this invention, two pairs of continuous chains are adjustably mounted on opposite sides of a pair of fixed support plates. The support plates extend longitudinally of the machine and are spaced from each other to provide a gap between the plates of predetermined width. The containers are moved in single or double rows towards the first support plate by conventional conveyor means and are moved onto the plate by conveyor pressure. A first pair of chains designed selector chains is mounted on opposite sides of the first support plate. Each of the selector chains is a continuous chain traveling in a fixed path

around a plurality of sprockets, one of which is a driven sprocket. The path of travel of each selector chain includes a portion inclined toward the first support plate, a portion running parallel to the plate and a portion inclined away from the plate.

Each selector chain is provided with a plurality of lugs adapted to engage the containers and propel them along the plate. The lugs on each chain are spaced apart so that they will engage behind every second or third container in the row, depending on the number of containers desired in a package unit. The selector chains thus initially select the number of containers that will be in the package unit and drive these containers along as groups toward a second pair of chains. It should be understood that the lugs on one selector chain are laterally aligned with corresponding lugs on the other selector chain so that the containers are engaged on both sides of the support plates. It should also be noted that the selector chains are driven at the same speed as the conveyor which delivers the containers to the machine so that there is no delay or relative movement of the containers in the transfer from the conveyor to the selector chains.

A second pair of chains, designated speed-up chains, are mounted generally forward of and above the selector chains on opposite sides of the support plates. Each of the speed-up chains travels in a continuous path around two or more sprockets, one of which is a drive sprocket. The path of travel of each speed-up chain includes a portion intersecting and aligned with a portion of the path of travel of a corresponding selector chain so that a driving lug on a selector chain and a driving lug on a speed-up chain can engage a given container at the same point in the movement of the container along the support plate. Since the path of travel of the speed-up chains is in a plane above the path of travel of the selector chains it is possible to arrange for the smooth transfer of a group of containers from driving engagement with a pair of opposed lugs on the selector chains to driving engagement with corresponding aligned lugs on the speed-up chains. The speed-up chains are driven at a greater linear speed than the selector chains, and the lugs on the speed-up chains are spaced apart a greater distance than the lugs on the selector chains. The speed-up chains accelerate the containers as a group so that relative movement occurs between the containers driven by the speed-up chains and the following containers driven by the selector chains. The groups of containers are thus spaced from each other by the speed-up chains and the grouping of the containers is completed.

Each spaced group of containers is driven by the speed-up chains across the gap between the first and second support plates. As the group is propelled across the gap; the path of travel of the speed-up chains diverges away from the support plates and the lugs of the speed-chains disengage from the group. At this point a flight bar extending transversely across the path of travel of the containers moves into the space between two spaced groups of containers and engages behind the first group to propel the group through the succeeding stations of the machine. The flight bars are arranged so that there is a flight bar ready to engage each group of containers as it is disengaged by the speed-up chains.

These and other features of this invention will now be described in detail with reference to the drawings, in which:

Figure 1 is a sectional side view of the machine of this invention.

Figure 2 is a perspective view showing the grouping section of the machine of this invention in detail.

Figure 3 is a top plan view showing the details of the grouping section of the machine of this invention.

The packaging machine of this invention comprises three main sections which are shown in Fig. 1 has a grouping section (A); a blank applying section (B); and a folding section (C).

The grouping section of this invention is shown in Fig. 2 as being mounted on the base, generally indicated 1, of a packaging machine at the rear end thereof. Containers are delivered in one or more rows to the machine by a conventional conveyor, generally indicated 2. The containers are moved by the conveyor 2 onto a first rigid plate 3. A second rigid plate 4 is mounted on frame 1 forward of plate 3 and is spaced from plate 3 to provide a gap 5 between the plates. (Note Fig. 3). Plate 4 extends forwardly beyond the grouping section, into the blank applying section B and on into the folding section C of the machine. (Note Fig. 1).

Extending transversely across base 1 are a plurality of support members 6. Slidably mounted on the support members on opposite sides of rigid plate 3 are a pair of support plates 7 and 8. Each of the support plates 7 and 8 is movable into partial overlapping relation with rigid plate 3.

The adjustable mounting of the support plates allows the grouping apparatus to be moved toward and away from rigid plate 3 in order to accommodate a single row of containers or a double row of containers moving into the grouping section of the machine.

The grouping apparatus on one side of the rigid plate 3 is identical to the grouping apparatus on the opposite side of the rigid plate; therefore it will only be necessary to describe the apparatus on one side in detail.

The grouping apparatus includes a first pair of chains generally indicated 9 and 10, designated selector chains, mounted on opposite sides of rigid plate 3. Chain 9 is a continuous chain mounted for movement in a fixed path about a plurality of sprockets. The sprockets include idler sprockets 11, 12 and 13 and a drive sprocket 14. (Note Fig. 2). Sprockets 11, 12, 13 and 14 are mounted on shafts 15, 16, 17 and 18 respectively. Each of the shafts is mounted on support plate 7 in a conventional manner.

Chain 9 is provided with a plurality of drive lugs 19 spaced a predetermined distance apart. The lugs are arranged to engage behind the last container of a predetermined number of containers to drive the containers as a group along rigid plate 3. The lugs 19 on chain 9 initially select the number of containers which will constitute the package unit. The number of containers in the group can be adjusted merely by adjusting the spacing of lugs 19.

Chain 9 is mounted so that a portion 20 of the chain converges toward rigid plate 3. This allows lugs 19 to be smoothly interposed behind the last container of the selected group to drive that particular group along rigid plate 3. A second portion 21 of chain 9 runs parallel to rigid plate 3. A third portion 22 of chain 9 diverges away from rigid plate 3 so that the driving lugs on the chain can be smoothly disengaged from the containers.

It should be noted at this point that chain 9 is driven at the same speed as conveyor 2, so that no relative movemnet occurs between the containers driven onto the plate by the conveyor 2 and those being driven by the lugs on chain 9. There is continuous uninterrupted movement of the containers along rigid plate 3.

A second pair of chains generally indicated 23 and 24, designated speed-up chains, is mounted generally forward of selector chains 9 and 10 on opposite sides of the rigid plates 3 and 4. Speed-up chain 23 is a continuous chain mounted on a pair of sprockets 25 and 26. Sprocket 26 is mounted on shaft 17 along with and above sprocket 13 of selector chain 9. Sprocket 25 is a drive sprocket mounted on a vertically extending shaft 27. Vertical shaft 27 depends from a miter box 27A mounted on a support member 28 which extends transversely across the machine above rigid plate 4. A horizontal drive shaft 29 mounted on top of support member 28 is connected by conventional gear means mounted in miter box 27A to vertical shaft 27. Vertical shaft 27 is adjustably mounted relative to support 28 so that sprocket 25 can be adjusted laterally along with the sprockets mounted on support plate 7. The adjustable mounting includes a plurality of slots in support plate 28 and an adjustable sleeve 29A for shaft 29.

Speed-up chain 23 is provided with drive lugs 30 adapted to engage a container in the same manner as drive lugs 19 on chain 9. Chain 23 includes a portion 31 converging towards rigid plate 3, a portion 32 running parallel to rigid plate 3 and a portion 33 diverging away from rigid plate 3 to facilitate the entry, driving engagement, and disengagement of the lugs 30 with the containers in the same manner as chain 9.

Speed-up chain 23 is arranged relative to selector chain 9 so that the position of a lug on the speed-up chain coincides with position of a corresponding lug on the selector chain 9 at a predetermined point in the movement of the containers. The predetermined point is the position of the containers wherein a lug 19 on the selector chain is about to disengage from a particular container while a lug 30 of chain 23 is engaging the container. This arrangement allows the smooth transfer of the driven container from selector chain 9 to speed-up chain 23.

Speed-up chain 23 is driven at a higher speed than selector chain 9. The difference in speed of the chains produces relative movement between those cans driven by the selector chain and those driven by the speed-up chain. The relative movement causes a space to develop between the containers and separates them into the groups which will comprise the package units. To compensate for the relative movement of the containers, the driving lugs 30 on the speed-up chain are spaced apart a greater distance than the driving lugs 19 on the selector chains. For example if lugs 19 are spaced 8" apart, the lugs 30 would be spaced 10" or more apart.

The groups of containers are thus spaced from each other by the speed-up chains and the grouping of the containers is completed.

The spaced groups of containers are driven by speed-up chains 23 and 24 across the gap 5 between rigid plates 3 and 4. As a given group of containers is driven across gap 5 it is disengaged by the lugs of the speed-up chains as they diverge away from the containers.

Coincident with the disengagement of the containers by lugs 30, the containers are engaged by a flight bar 40 which drives the containers spaced groups through the succeeding sections of the machine.

Flight bars 40 are disposed transversely of the machine and travel in a continuous path which extends above and below rigid plate 4. (Note Fig. 1). The flight bars are mounted between a pair of laterally spaced continuous flight chains 41 and 42. Flight chain 41 is mounted on a plurality of sprockets 43, 44 and 45 which are in turn mounted on shafts 47, 48 and 49 journalled in the side frames of the machine. Sprockets

44 and 45 are shown in Fig. 2. Sprocket 43 is not shown. Flight chain 42 is mounted on a plurality of sprockets 43^1, 44^1 and 45^1 which are also mounted on shaft 47, 48 and 49 respectively. (Note Fig. 1). As is apparent from Figure 1 of the drawings each flight bar 40 travels in a continuous path around rigid plate 4. The spacing and speed of the flight bars is arranged so that a flight bar moves up through gap 5 into engagement with a group of containers just as the containers are released by the lugs of the speed-up chains. The flight bar propels the grouped containers through the blank applying section B and through the folding section C of the machine.

The flight bars 40 drive the groups of containers at the same speed as they leave the speed-up chains 23 and 24. Thus there is no relative movement between the groups of containers leaving the speed-up chains and those groups of containers being driven by the flight bars. The flight bars are positioned to maintain the spacing between the groups of containers.

The flight bars, speed-up chains, and selector chains, are driven from a common power source 60 by an arrangement of sprockets and chains which will now be described. By driving these elements through a common power source, the problem of coordinating the relative speed of these elements is minimized since the speed of a single drive motor is constant; whereas in those arrangements where several drive motors are used, the relative speed of the drive varies and poses a coordinating problem.

Electric motor 60 is connected to shaft 47 by means of chain 61 and a sprocket 62 which is mounted adjacent sprocket 43. Shaft 47 in turn drives flight chains 41 and 42. Flight chains 41 and 42 drive shafts 48 and 49 through their respective sprockets as shown in Fig. 1. A sprocket (not shown) is mounted on shaft 49 adjacent sprocket 45 and is connected to a sprocket 50 on shaft 29 by means of chain 51. (Note Fig. 2). Shaft 29 drives shaft 27 through the gears (not shown) in miter box 27A. (Once again only the driving arrangements of the speed-up chain and selector chain on one side of the rigid plates will be described; it being apparent that the drive on the other side of the rigid plates through the other miter box 27B is identical in operation.) Shaft 27 drives sprocket 25 which drives speed-up chain 23. The speed-up chain 23 drives sprocket 26 which is keyed to shaft 17. Shaft 17 mounts idler sprocket 13 which is free to rotate relative to the shaft. Keyed to shaft 17 below plate 7 is another sprocket 52. (Note Fig. 2). Sprocket 52 drives shaft 18 through sprocket 53 and drive chain 54. Shaft 18 has keyed thereto sprocket 14 which drives the selector chain 9. The selector chain 9 being mounted on drive sprocket 14 and idler sprockets 15, 16 and 17 as described above. By this arrangement it is possible to have the speed-up chains, the selector chains and the flight bars driven at different relative speeds from the same power source which is motor 60.

Although this invention has described in detail according to the specific embodiment shown in the drawings, it is not intended to be limited by this description.

It is anticipated that certain modifications and variations in design will be apparent to those skilled in the art which will be within the scope of the appended claims.

WHAT WE CLAIM IS:—

1. Apparatus for separating continuously moving rows of objects into package groups characterized by, first conveyor means continuously moving rows of objects forward onto a stationary plate, a pair of laterally spaced endless selector means having lug means thereon adapted to engage a group of said objects at spaced diametrically opposed intervals and to propel said group along said stationary plate toward a pair of laterally spaced endless speed-up means, each of said pair of speed-up means having lug means thereon spaced a greater distance apart than the lug means on each of said pair of selector means, means driving said pair of speed-up means at a greater speed than said pair of selector means to accelerate said groups of objects, the difference in speed and the spacing of the lugs of said pair of speed-up means being effective to separate said rows of objects into spaced package groups each containing a predetermined number of units.

2. The apparatus of claim 1 characterized by a second conveyor means adapted to engage in the space between said groups to drive the groups beyond said speed-up means.

3. The apparatus of claim 1 or 2 characterized by a first pair of chains mounted for continuous movement in a horizontal plane on opposite sides of a rigid plate, first lug means on each of said first pair of chains adapted to engage said containers at spaced intervals to propel the containers toward a second pair of chains, a second pair of chains mounted for continuous movement in a horizontal plane generally forward of said first pair of chains, second lug means on each of said second pair of chains adapted to engage said containers at spaced intervals, said second lug means being mounted on each of said second pair of chains a greater distance apart than the lugs means on each of said first pair of chains, and common drive means adapted to drive said second pair of chains at a greater speed than said first pair of chains.

4. The apparatus of Claim 1 characterized by a pair of selector chains, sprocket means mounting each of said selector chains for movement in a continuous hori-

zontal path on opposite sides of a first rigid plate, lug means on each of said selector chains arranged to engage behind a plurality of containers on said first rigid plate to drive said containers a predetermined distance along said plate and to disengage from said containers, a pair of speed-up chains, sprocket means mounting each of said speed-up chains on opposite sides of said first rigid plate for movement in a fired horizontal path, lug means on each of said speed-up chains arranged to engage behind the containers as they are disengaged by said selector chains, drive said containers past said first rigid plate onto a spaced second rigid plate, and then disengaged from said containers, means driving said speed-up chains at a greater linear speed than said selector chains, said drive lugs on each of said speed-up chains being spaced apart a greater distance than said lugs on each of said selector chains, the difference in speed and lug spacing of said selector chains and speed-up chains being effective to arrange said containers into spaced groups having a predetermined number of containers in each group.

5. The apparatus of Claim 1 characterized by a pair of selector chains adjustably mounted on opposite sides of a first rigid plate, each of said selector chains being mounted on a plurality of sprockets for continuous movement in a fixed horizontal path, the path of movement of each of said selector chains including a portion converging toward said rigid plate, a portion running parallel to said rigid plate and a portion diverging away from said rigid plate, each of said selector chains being provided with a plurality of drive lugs spaced apart a predetermined distance to engage behind a plurality of containers positioned on said rigid plate to drive said containers along the plate in selected groups, a pair of speed-up chains, adjustable sprocket means mounting each of said selector chains for movement in a fixed horizontal path generally above and forward of said selector chains, each of said speed-up chains being provided with a plurality of drive lugs spaced apart a greater distance than the drive lugs on each of said selector chains, the path of movement of each of said speed-up chains including a portion converging toward said rigid plates, a portion running parallel to said rigid plates and a portion diverging away from said rigid plate, the paths of movement of said selector chains and said speed-up chains intersecting at a common point so that as a drive lug on the selector chain disengages said group of containers a drive lug on said speed-up chains will engage said containers, common drive means propelling said speed-up chains at a greater speed than said selector chains to accelerate the groups of containers being driven by the speed-up chains, a second rigid plate mounted generally forward of said first rigid plate and spaced therefrom, conveyor means adapted to pass through the space between said first and said second rigid plates to engage said groups of containers as they are disengaged by the drive lugs on said speed-up chains, the difference in spacing of the drive lugs on the speed-up chains and the selector chains and the difference in speed of the selector chains and speed-up chains being effective to arrange the containers into spaced groups having a predetermined number of containers.

6. The invention substantially as illustrated in and as described with reference to Figs. 1—3 of the accompanying drawings.

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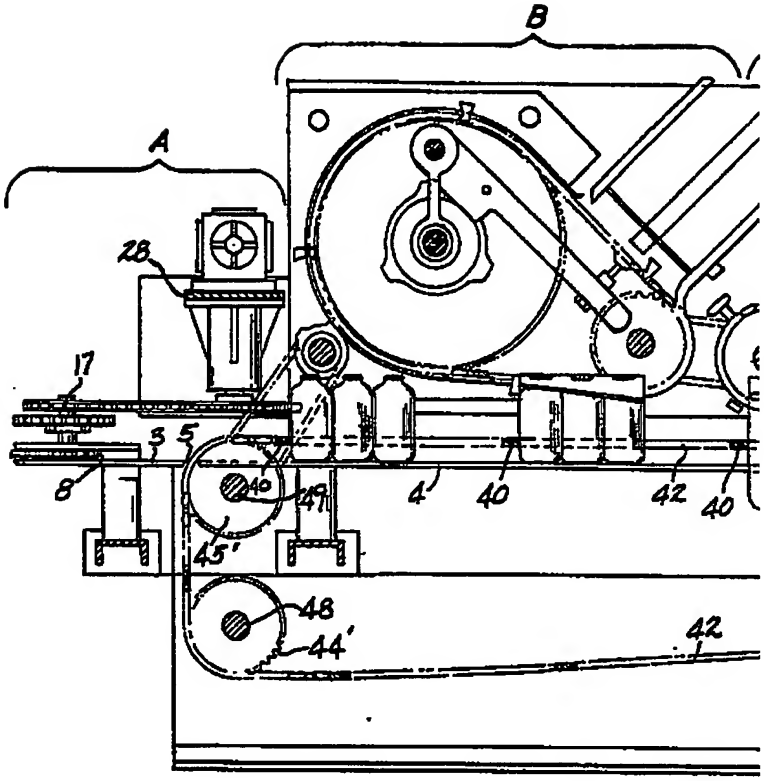

FIG -1

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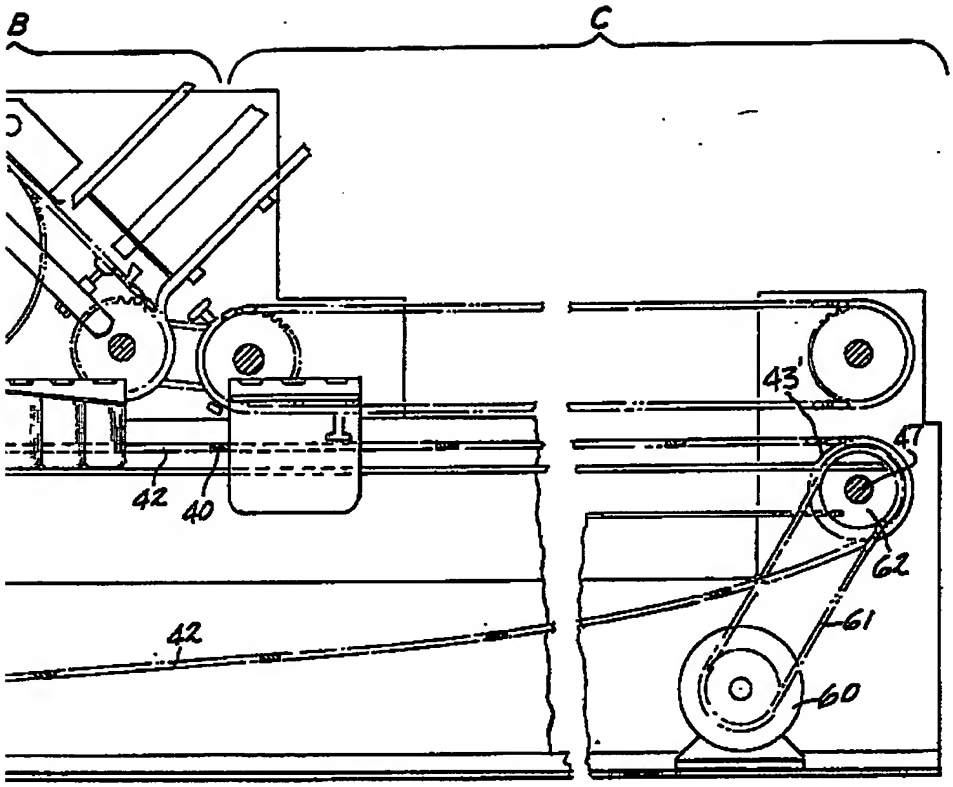

FIG -1

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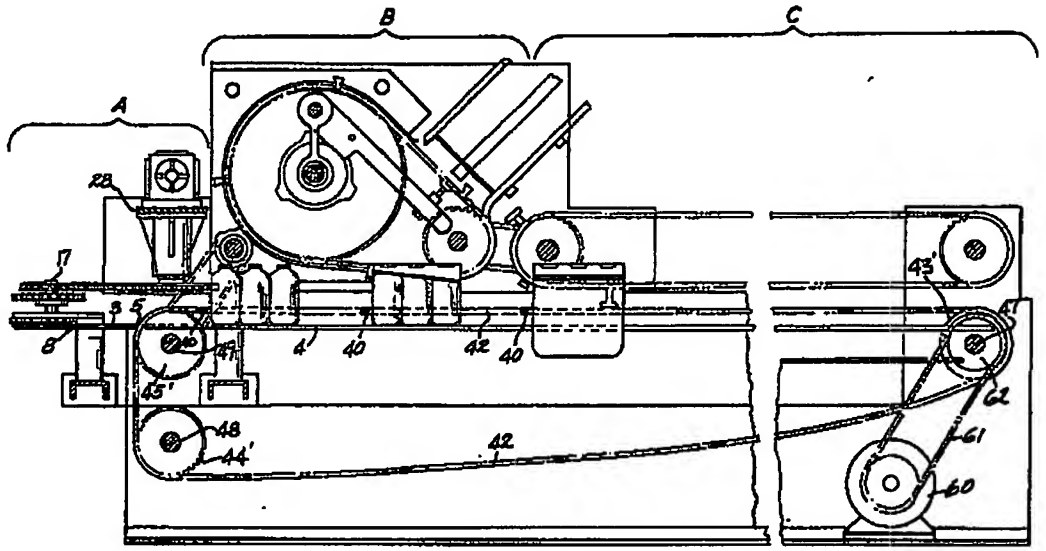
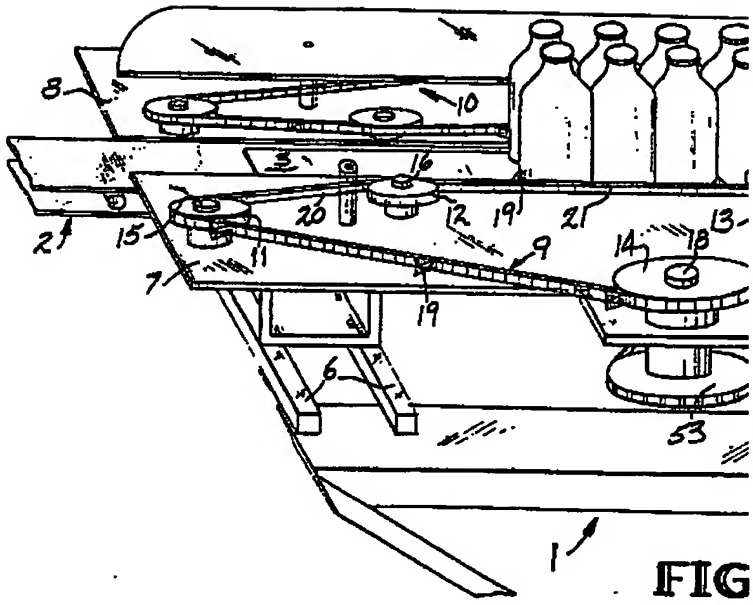


FIG -1



FIG

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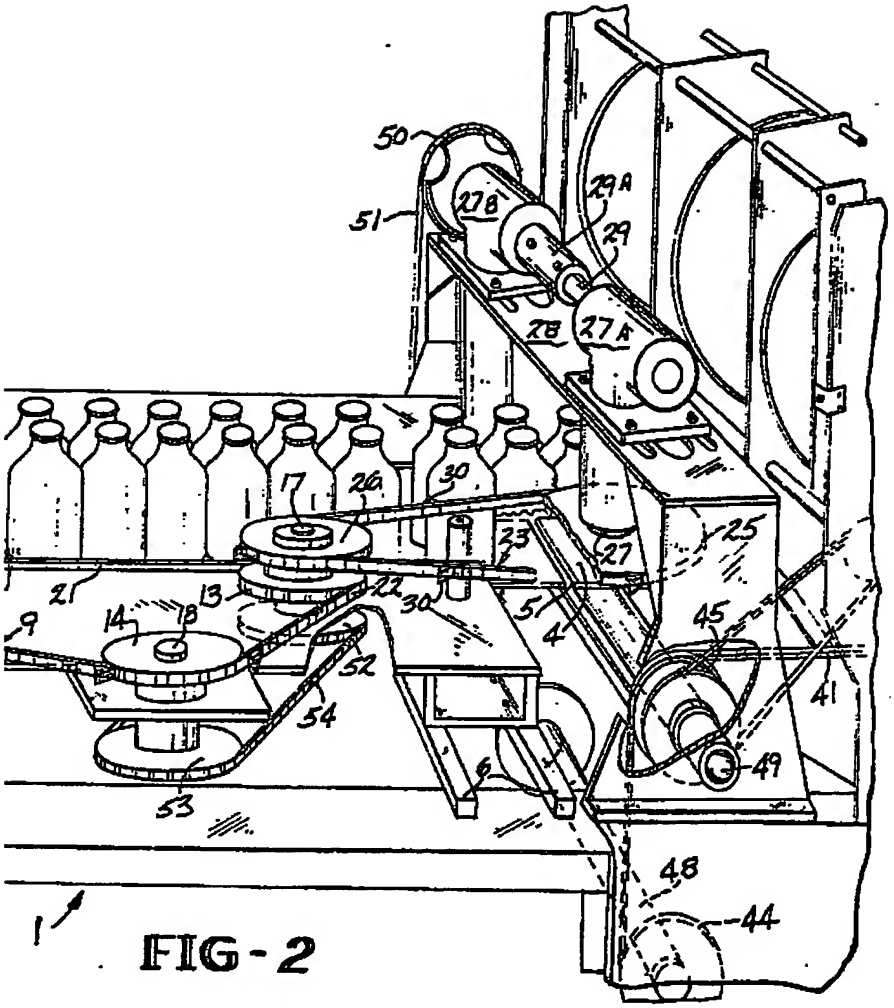

FIG-2

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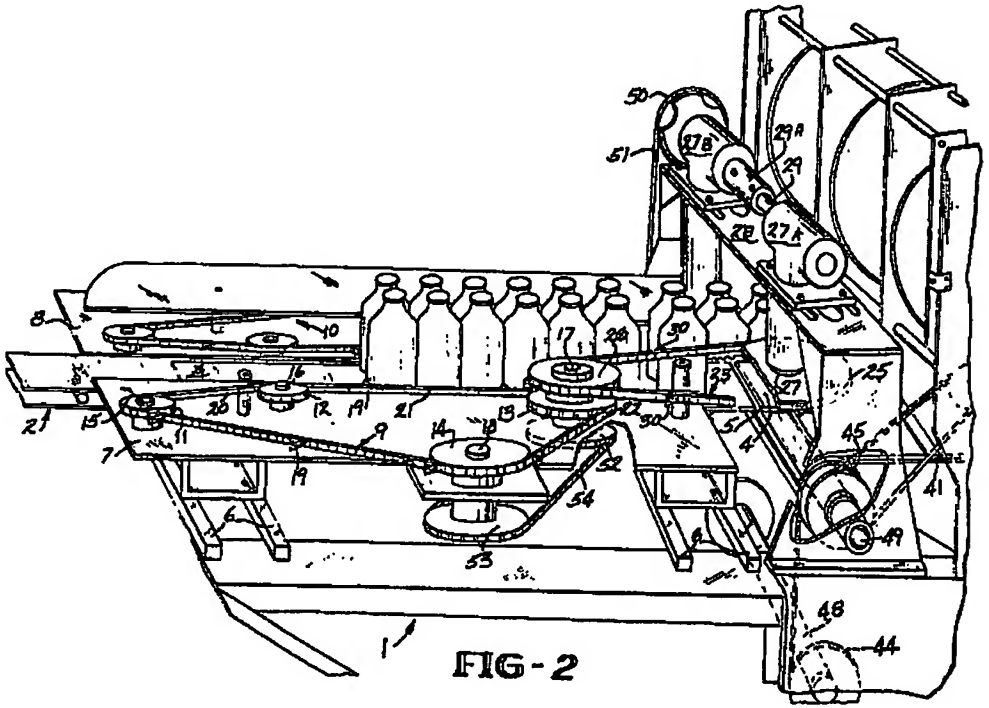

FIG-2

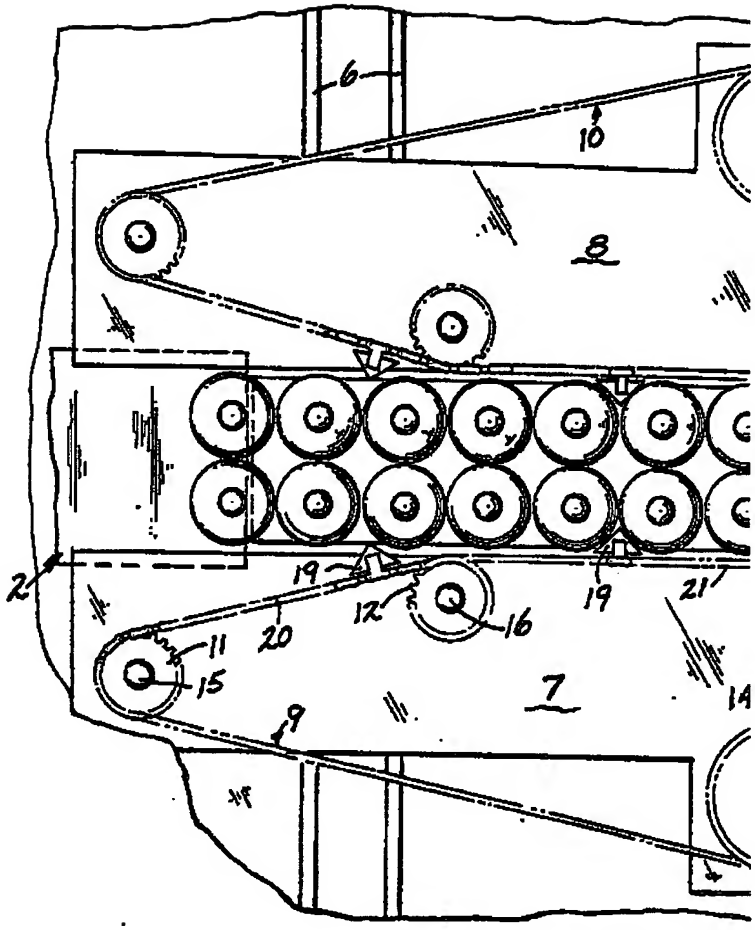

FIG - 3

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Sheet 3

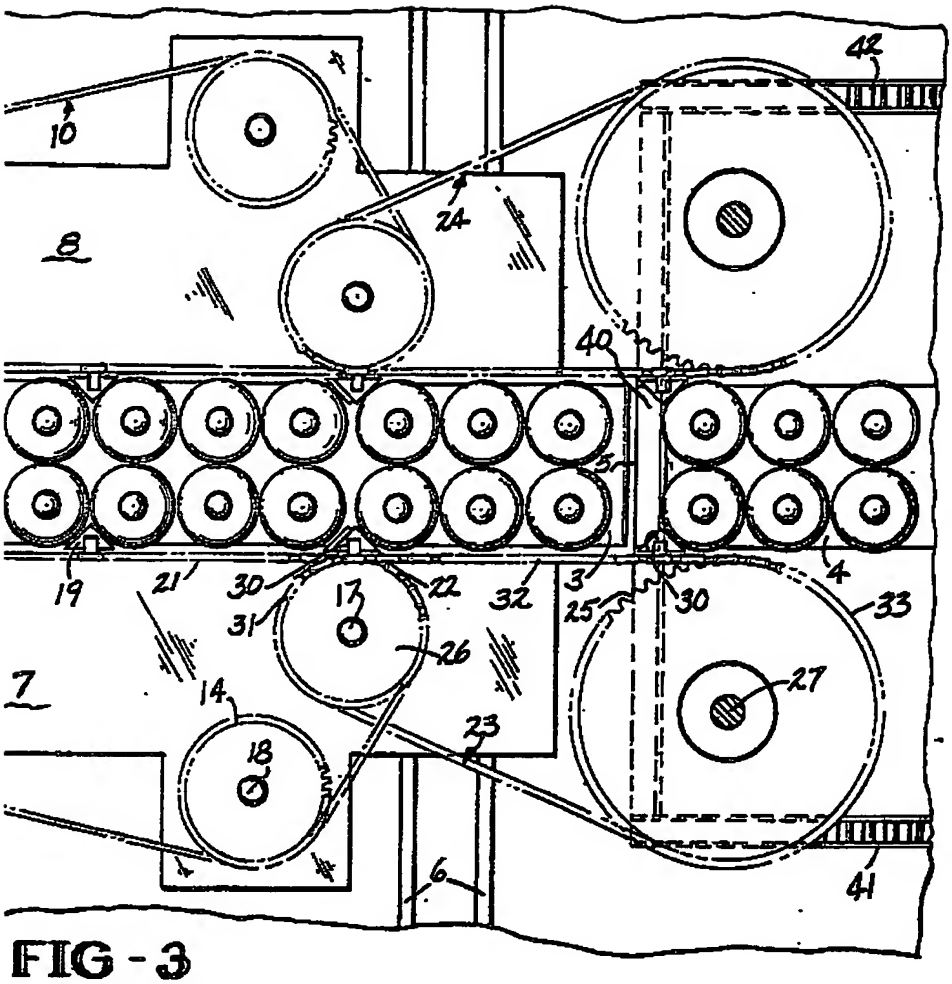

FIG - 3

874995 COMPLETE SPECIFICATION

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Sheet 3

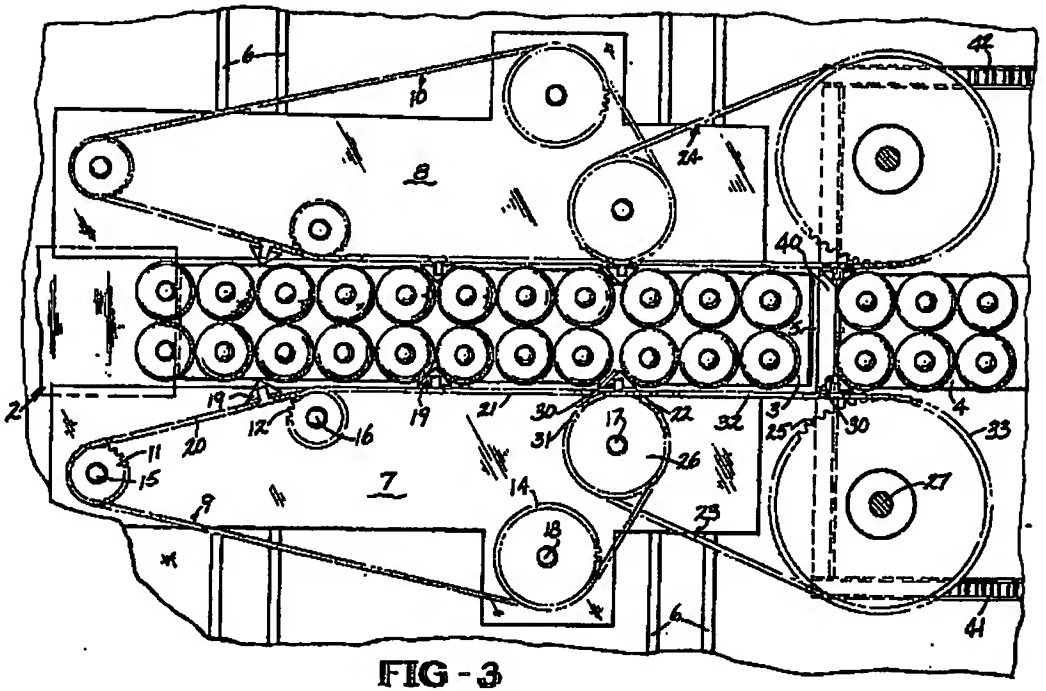

FIG - 3